

Cairo University Children Hospital

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Practical Guidelines (Protocol) for Management of Diarrhea And Dehydration In Gastroenteritis Unit

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Diarrhea is the major worldwide pediatric problem and it is serious problem in the developing countries.

Diarrhea is defined as: stools of increased frequency, fluidity and volume >3 times/day. Or altered consistency of the stool.

How to deal with case of Diarrhea

[I] Diagnosis:

1. *Infectious:*

a) Viral.
b) Bacterial.
c) Parasitic.

2. *Non-Infectious.*

[II] Dehydration:

1. *Degree:*

a) No dehydration.
b) Some dehydration.
c) Severe dehydration

2. *Type (According to serum Na^+):*

a) Isotonic.
b) Hypertonic.
c) Hypotonic.

[III] Other Complications:

- Shock, Acidosis, Electrolytes disturbance, Bleeding, Hemolytic Uremic Syndrome (HUS), DIC and Convulsion.

Example for diagnosis:

Acute gastroenteritis, severe dehydration, shock, bleeding, DIC,

Management of Diarrhea

I - Rehydration + Feeding = Oral Rehydration Therapy (ORT).
II - Treatment of infection.
III - Management of complication.

To reach the proper diagnosis and management, perform the following:

I. History:

- Diarrhea, duration, frequency, consistency (± mucous, blood).
- Vomiting, duration, frequency, character (i.e., projectile, regurge, coffee ground vomitus).
- Fever.
- Urinary flow.
- Bleeding.
- Convulsions.
- ***Feeding:***
  1) Breast milk.
  2) Formula, how many feds/day, how mixing with water.
  3) Weaning: type of foods administered.
- ***Medication:***
  1) Antibiotics.
  2) Antidiarrheal.
  3) ORS (amount – how to mix).

II. Examination:

A. General Condition:

- Appearance.
- Breathing.
- Circulation to skin.

Ex.: Looks well, ill, sick, toxic, respiratory distress, cyanotic, pale, mottled skin.

B. Weight: for estimation of fluid intake and follow up.

C. Degree of dehydration:

1. No dehydration.

2. Some dehydration:
If the child has two or more of any of the following signs:

- Restlessness, irritable.
- Thirsty and drinks eagerly.
- Sunken eyes.
- Skin pinch goes back slowly.
- Depressed fontanel.

3. Severe dehydration:

Has two or more of the following signs:

- Lethargic.
- Unconsciousness.
- Sunken eyes.
- Drinks poorly, or unable to drink.
- Capillary refill (>2 sec).
- Cold extremities.
- Skin pinch goes back very slowly.

III. Systemic examination:

1. ***Chest-heart:***
   For chest infection, abnormal sounds, tachycardia, murmurs.
2. ***Abdomen:***
   For masses, distention, organomegaly.
3. ***CNS:***
   Convulsions (tonic, colonic, tonic-colonic, abnormal movement) – brain edema – increased intracranial tension (ICT) – CNS infection.

Management

Out-patient

- Any case of diarrhea.
- Any dehydration.

In-patient

- Post-shock.
- Severe elect. disturbance proved by lab.
- Suspected bleeding tendency, (hypoprothrombinemia, hemolytic uremic syndrome (HUS), DIC.
- Frequent losses (vomiting – diarrhea).
- Suspected intestinal obstruction.
- Brain edema, ± convulsions.
- Neurological insults.

Management in Out-patient Department:

[I] Diarrhea with no dehydration:

Counsel the mother on 3 rules for home treatment:

1. Give extra fluids:

- Teach the mother how to mix and give oral rehydration solution (ORS)/200 mL water.
- Slowly by cup and spoon every 1-2 min or by bottle (slowly).
- Up to 2 years 50-100 mL after each loose/watery motion.
- Two years or more 100-200 mL after each loose watery stool.

2. Continue feeding:

- If breast feeding (BF) .... continue.
- If not exclusive BF, give food based fluids; soup, Rice water or artificial milk if mother can afford.
- Sugar free diet.

3. When to return back for consultation:

- Drinks more than 4-5 ORS packets/day.
- Drinks poorly or unable to drink.
- High fever – rapid breathing.
- Bloody stool.
- Severe abdominal distention.

[2] Diarrhea with some dehydration:

Refer to the oral section to receive ORS for 2-4 hours.

- About 50-80 mL/kg over 2-4 hours by cup and spoon/every 1-2 min or frequent sips from cup for older children.
- Check regularly to see improvement or any problems.
- If child vomits, give ORS very slowly.
- If child's eye lids become puffy, stop ORS.
- Reassess within 4 hours, still has some dehydration add more ORS.
- If mother has to leave before 4 hours, teach her to complete rehydration at home. Instruct her 3 rules, and when to return.
- Advice breast feeding if the child wants.

If gets worse shift to IV fluid (failure of ORS):

- ***Reassess ... within 4-6 hours and classify the dehydration again then treat accordingly:***

a. No Dehydration: → Discharge

- If possible, observe the child for few hours to make sure that mother can maintain hydration by giving ORS.
- Discharge from out-patient clinic and oral rehydration section by 3 golden rules.

b. Sill dehydration

- If able to drink manage as some dehydration till discharge.
- If failed ORS, shift to I.V fluids/consider admission.

c. Complication

- Deteriorating general condition.
- Altered mental status.
- Coffee ground vomitus.
- Convulsion.
- Severe abdominal distention, intestinal obstruction?
- Bleeding tendency.
- Severe respiratory distress.
- Electrolyte disturbance
  - ⋆ Severe hypernatremia, Na >160 mEq/L or hyponatremia <120 mEq/L.
  - ⋆ Severe hypokalemia <2 mEq/L.
  - ⋆ Severe hypoglycemia or hyperglycemia (usually occurs in severe dehydration/shock).
  - ⋆ Severe metabolic acidosis (occurs in severe condition).

Admit to in-patient section

] Severe dehydration ± shock:

- Start IV fluid immediately.
- If possible drain blood sample before set up the line for serum Na^+, Ka^+, creat, BUN, glucose, blood gases.
- If difficulty to set up IV, insert nasogastric tube with ORS, until IV line is in place or use interaoseous cannulation .
- Solutions used for IV fluid.

Polyvalent, Pansol, Methahydrane (100 mL/kg) divided as follows:

Age	First give 30 mL/kg in	Then give 70 mL/kg in
Infants under 12 m	1 hour	5 hours
Children (12 m – up to 5 years)	30 min	2.5 hours

- If the child is able to drink treat accordingly, you may try some sips of ORS or breast milk.
- If the pulse is very weak or not detected after antishock therapy (**consider admission to ICU**).

Management at In-patient Department

Cases for admission:

- Shocked cases not responding to management in OP clinic after antishock measures (30 mL/kg/half-one hour).
- Complications associated with diarrhea.
  1. Diarrhea + pneumonia.
  2. Sepsis with high fever, bleeding tendency.
  3. Bloody diarrhea with bad general condition.
  4. Severe electrolytes disturbance.
  5. Severe abdominal distention.
  6. Complicated persistent diarrhea.
  7. Bleeding tendency, coffée ground vomitus, ecchymosis.
  8. Suspected intracranial tension (ICT), neurological disorders e.g., convulsions.

Work up and investigation at in-patients dept:

- Admission sheets, follow up sheets and progress notes should be filled up.
- Routine investigations for all admitted eases:
  1. Stool analysis routinely, stool culture/sensitivity, if needed.
  2. Serum electrolytes "Na^+, K^+, Ca^{++}" and glucose.
  3. Blood gases.
  4. Renal functions (BUN – Creat).
  5. CBC – CRP.
  6. Others, if indicated (liver functions, PT, PC, T. protein, Albumin, ...)

Treatment of Complications:

**** Hypokalaemia:*** (Serum $K^+ < 2.5\text{-}3$ mEq/L)

- ***When to suspect:***
  1. Severe losses (mainly vomiting).
  2. Abdominal distention.
  3. Severe losses + protein energy malnutrition (PEM).
- If serum $K^+ \leq (2.5\text{-}3$ mEq/L) and child is asymptomatic, give oral potassium, 1-4 mEq/kg/24 hr
- If serum $K^+ < (2\text{-}2.5$ mEq/L) → I.V rout.
  K^+ required use this equation:

- $$\frac{\text{B. wt.} \times \text{deficit } (3.5\text{-serum } K^+ \text{ level}) \times 0.6}{2} = \text{K needed for replacement}$$

  Add it to I.V therapy, (Never direct I.V).
- OR : use I.V solution containing K 40 mEq/L, or 60 mEq/L in severe hypokalamia.

MONITOR Serum K closely.

Consult nephrologists.
Consult neurologist.
- Role out; CNS infection or ↑ICT.
- If serum Na still high consider peritoneal dialysis.

Metabolic acidosis:

- The serum HCO_3 and PH fall and PCo_2 decreases.
- Metabolic acidosis due to diarrhea and dehydration is usually with normal anion gap.
  Anion gap = (Na + K) – (CL + HCO_3).
- Normal anion gap = 12 mEq/L with range 8-16 mEq/L
- If HCO_3 <5 mEq/L give Na HCO_3 (8.4%).
  (12-serum HCO_3) × BW × 0.3 = (HCO_3 deficit)
- If HCo_3 10-15 mEq/L and PH less than 7.2 give Na HCO_3. if PH >7.2 correct dehydration and reassess.

Convulsion:

- Initially correct metabolic causes (hyper Na^+ , hypo Na^+, hypo Ca^{++}, hypoglycemia).
- If recurrent, diazepam IV or rectally by 0.1 mg/kg, or Phenobarbital loading dose 20 mg/kg IV slowly.
- If recurrent think of Encephalopathy, CNS infection.
- Consult seniors for, 1-CSF 2-CT brain 3-EEG.

Hyperglycaemia:

- Bl glucose may reach > 400 mg/dL or more, it is considered as (stress hyperglycemia), due to release of stress hormones, that block insulin action.
- After correction of dehydration and shock, if hyperglycemia persists, **consult diabetologist for insulin therapy**.

Respiratory distress:

- May be due to:
  1. Shock.
  2. Intra-pulmonary Hg.
  3. Severe infection
  4. Septicemia.
  5. Metabolic acidosis.

Treat accordingly .....

*** Hyponatremia:**

- Serum Na (<120-125 mEq/L).
- ***When to suspect:***
  1. Severe dehydration.
  2. Shock.
  3. Severe losses + PEM.
  4. Disturbed conscious level.
- If (<120 mEq/L) give hypertonic solution (Saline 2.7%) to raise serum Na as follows:

  (125 – serum Na) × 0.6 = total mEq, needed to correct serum Na (over 2-3 hours).

  Then if serum Na become 120 mEq/L or more manage accordingly.

*** Hypernatreamic dehydration:**

- Serum Na (>150 mEq/L).
- ***When to suspect:***
  1. History of faulty mixing ORS, or increase intake prior to attending the hospital >5 packets/day.
  2. Severe dehydration.
  3. Irritability – altered mental status, convulsions.
- If serum Na^+ (150-160 mEq/L) ORS is effective. Such cases can be treated in out-patient unless accompanied with other complications.
- If Na^+ 160 mEq/L or more (solution used not more than 60 mEq/L) i.e., Kadlex: Na Hco_3 (8.4%)

  15 : 1

  470 cc : 30 cc

  In a rate of 100-130 mL/kg/ 24 hours, according to dehydration, status.
- Monitor serum Na every (8-12 hours).
- If serum Na decreases by 0.5-1 mEq/L ≃ 12 mEq/ 24 hours, you are on proper path.
- Sips of plain water can be given orally by 5 mL/kg/day during IV therapy.

Reassess:

- If Na becomes within normal, manage according to clinical evaluation.
- Still high (>160 mEq/L) continue IV fluids with Na not more than 60 mEq/L.
- Up to 160 mEq/L, no dehydration, stable, ... tolerate oral, shift to oral rehydrantion .. with ORS for ongoing losses and start feeding.
- If child developed convulsions, or renal impairment:

Feeding after rehydration

If child is on breast milk, continue as the child able to drink.
If child on artificial milk ½ conc. – then increase gradually to full concentration.
If child 6 m or older; soft foods (soup, mashed chicken, vegetables yoghurt, cereals, ...).
If diarrhea continues with feeding and milk, suspect lactose intolerance: Clinitest +ve for disaccharides or reducing substances in stool → Give lactose free formula.
If diarrhea persist consider elemental formula or partial parenteral nutrition.

Drugs and diarrhea

Anti-diarrheal drugs → no role in management of diarrhea.
Anti-emetics → limited role in treating persistent vomiting.

imicrobial and diarrhea:
Should not be given routinely to children with diarrhea.
Only in:
- Bloody diarrhea with bad general condition.
- Suspected cases of Gardia, Amoeba.
- Diarrhea associated with extra-intestinal infection, e.g., pharyngitis, otitis media, skin infection, chest infection, septicemia 3rd generation cephalosporin or amoxicillin , And/or Metronidazole, ... are the drugs of choice.

.B.: Usually start by single antibiotic.

* Bleeding:

I. Hypoprothrombenemia:

- Bleeding from veniputure.
- PT, PTT, high
- Plat count, ----- low.

Give vit K 1-2 mg/IM

II. DIC:

- The previous finding +
- Severe anemia.
- ± coffée ground vomiting.
- Purpuric eruption.
- FDP +++ (Fibrin degradation products).

Fresh blood transfusion/fresh frozen plasma, aggressive antibiotics, maintain hydration, treat other complications.

III. HUS:

- Bleeding tendency.
- Severe anemia.
- ± Hematurea.
- ± impaired renal function
- Liver function ++
- Hepatosplenomegaly.

Consult Nephrologist:

Clinical particulars (in out-patient clinic):

[I] Assessment of diarrhea patients for dehydration:

	No dehydration	Some dehydration	Severe dehydration
Look at: The case Eyes Thirst	Well, alert. Normal. Drinks normally, not thirsty.	Restless, irritable Sunken eyes. Thirsty, drinks eagerly.	Lethargic, unconsciousness Sunken eyes. Drinks poorly, or unable to drink.
Feel: Skin pinch	Goes back quickly	Goes back slowly	Goes back very slowly
Decide	Patients has no dehydration	Has two or more signs, there is some dehydration	Has two or more signs of the above, it is severe dehydration
Treat	Give three golden roles: - Extra fluids /ORS - Continue feeding - When to return?	Weight the patient and treat at OP section with ORS by cup and spoon.	Weigh the patient and start IV fluids.

[II] Investigations can be carried out in OP clinic:

- Stool analysis only for bloody diarrhea and persistent diarrhea >14 days.
- Serum electrolytes: Na – K^+, Ca^{++} and glucose only for severe dehydration & shock and dehydration with convulsion.
- Kidney functions BUN, Creat for severe dehydration shock, decreased urinary flow.
- CBC only for pallor, bad general condition and fever.

[III] For discharged cases after rehydration:

Consider 3 rules + medications required according to clinical conditions, e.g.:

- Antipyretics → paracetamol (10-15 mg/kg/dose).
- Antiparastic → metronitazole (15-30 mg/kg/dose)
  → nitazoxanide 7.5 mg/kg/dose
- Antibiotics should not be given as a routine for acute diarrhea.
- Zinc supplementation (1-3mg/kg) for 10-14 days with other micronutrients.
- Pre biotics and pro biotics can help in shortening diarrhea duration.
- Contact senior unit members for any enquiry.

- Amoxicillin
- 3rd generation cephalosporin } Drug of choice, if indicated
- Azithromycin for (shigellosis & campylobacter).